



# Malta Pumped Heat Energy Storage System

## Green Heat & Power Application



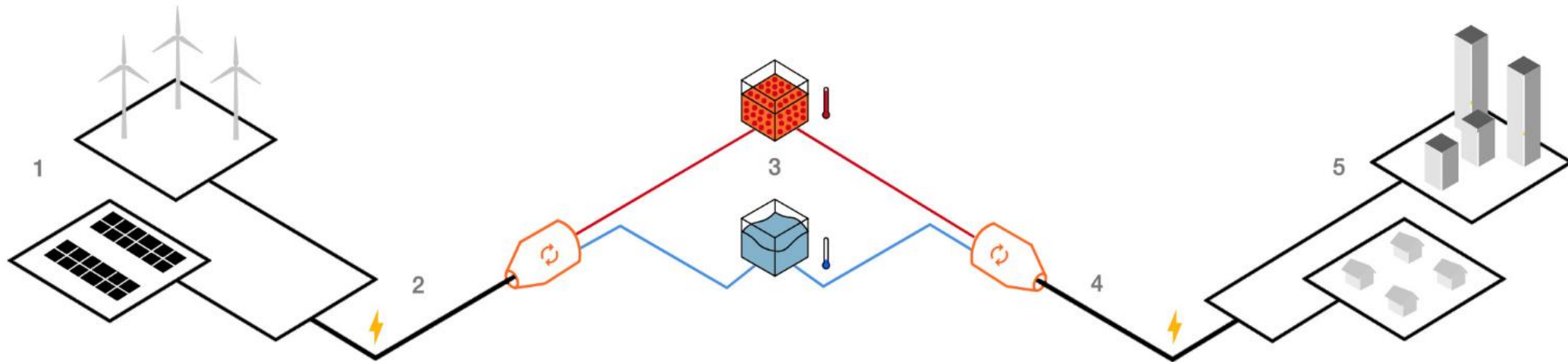
Energy Storage for Manufacturing and Industrial Decarbonization Workshop

Bao Truong, Malta Inc.

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# Introduction to Malta PHES

Long Duration (8-200 hr)  
Grid Scale (100+ MW)  
Thermal Storage using Molten Salt

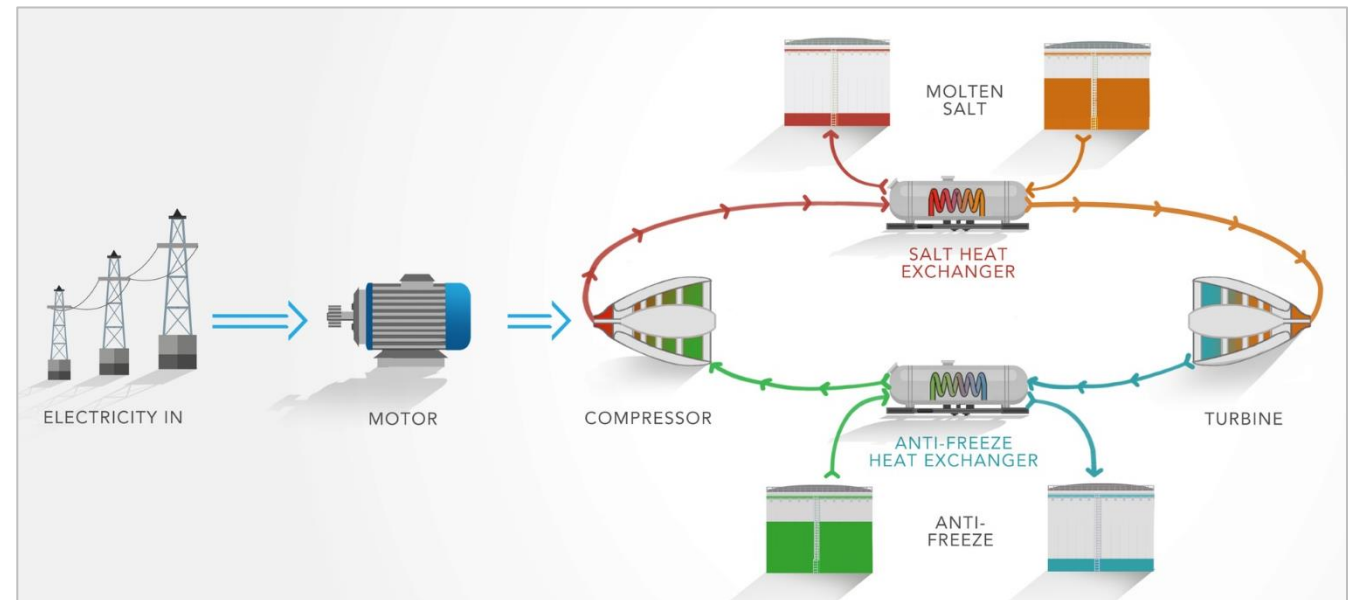


# Charge Cycle Overview – Storage

**Charge mode** – system operates as a heat pump:

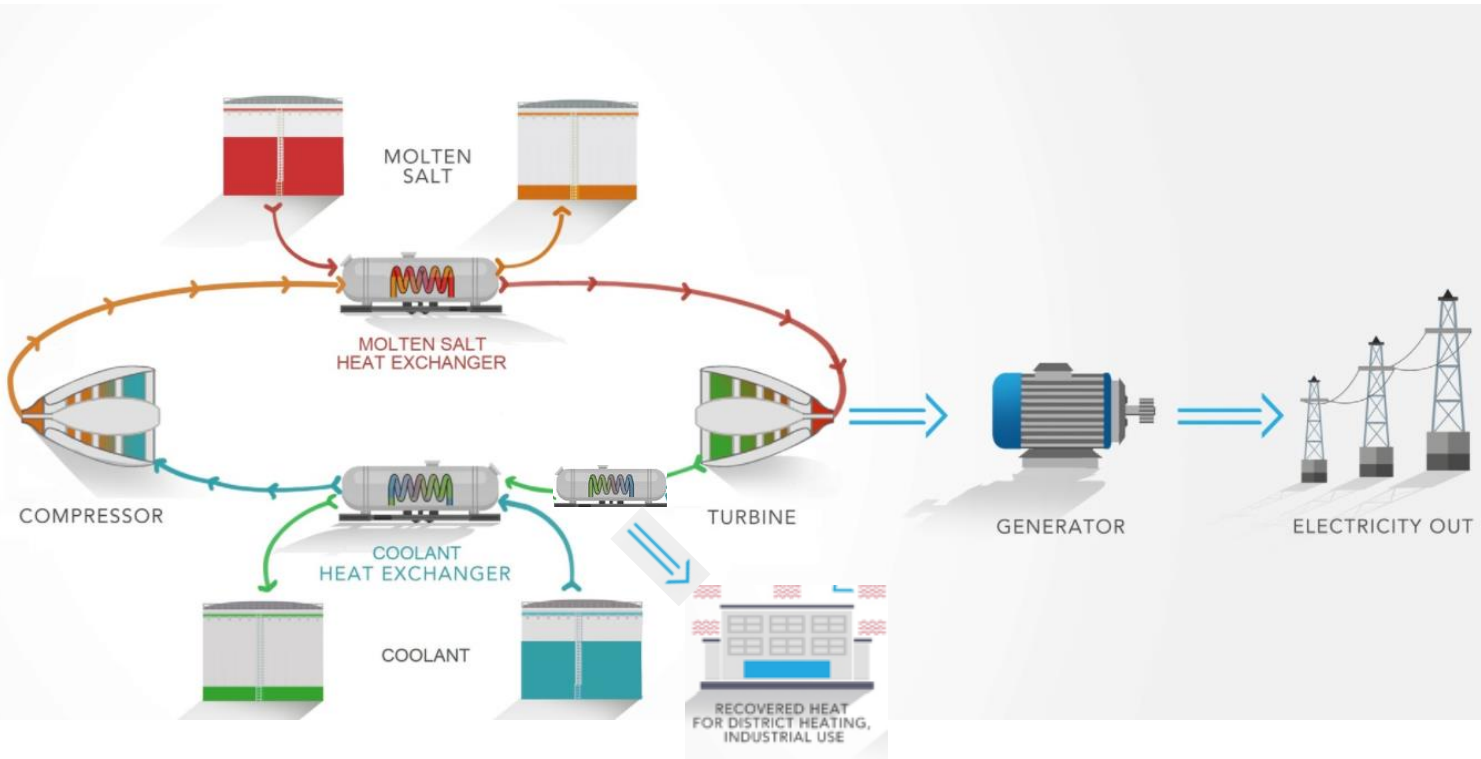
1. Electricity from the grid drives compressor, which compresses warm air into higher pressure, very hot air
2. Salt heat exchanger stores the heat in molten salt
3. Warm air expands efficiently across a turbine, making it very cold
4. Anti-freeze heat exchanger “stores the cold”
5. Warmed air circulates back to the compressor

Malta Charge Cycle



# Discharge Cycle Overview – Generation

Malta Discharge Cycle



**Discharge mode** – system operates as a heat engine:

1. Thermal energy released from hot molten storage tank
2. Salt heat exchanger heats air, maximizing energy to drive turbine
3. Hot air expands across turbine generating electrical energy
4. Anti-freeze heat exchanger cools air for easier compression
5. Compressor increases pressure again to close the cycle



# Malta PHES in Industrial Decarbonization Context

- Malta PHES shifts low value electricity to the followings:
  - High value/industrial load electricity
  - Discharge heat as industrial process heat ( $\sim 120^{\circ}\text{C}$ )
  - Boosted discharge heat (using a supplemental heat pump) for higher temperature processes